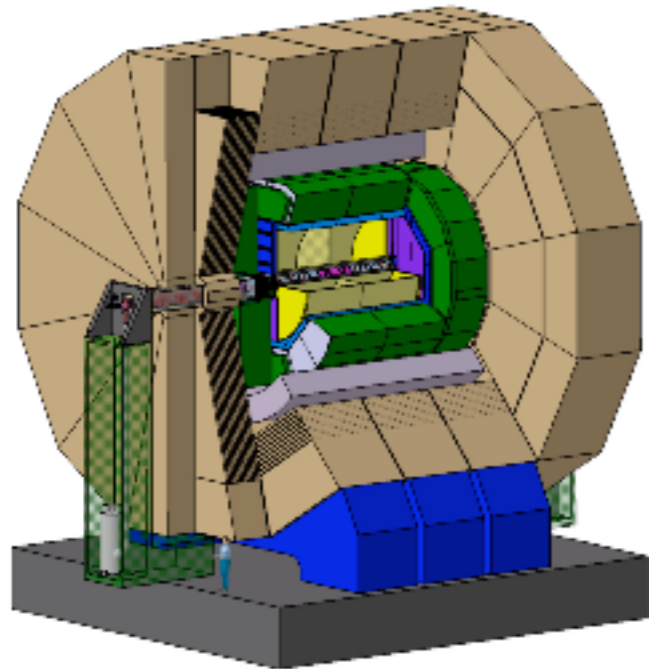


# ILD status & plan



LOI Mar.2009

Paris Jan.2010

performance study  
evaluate technologies  
integration

solid & reliable design

**DBD end of 2012**

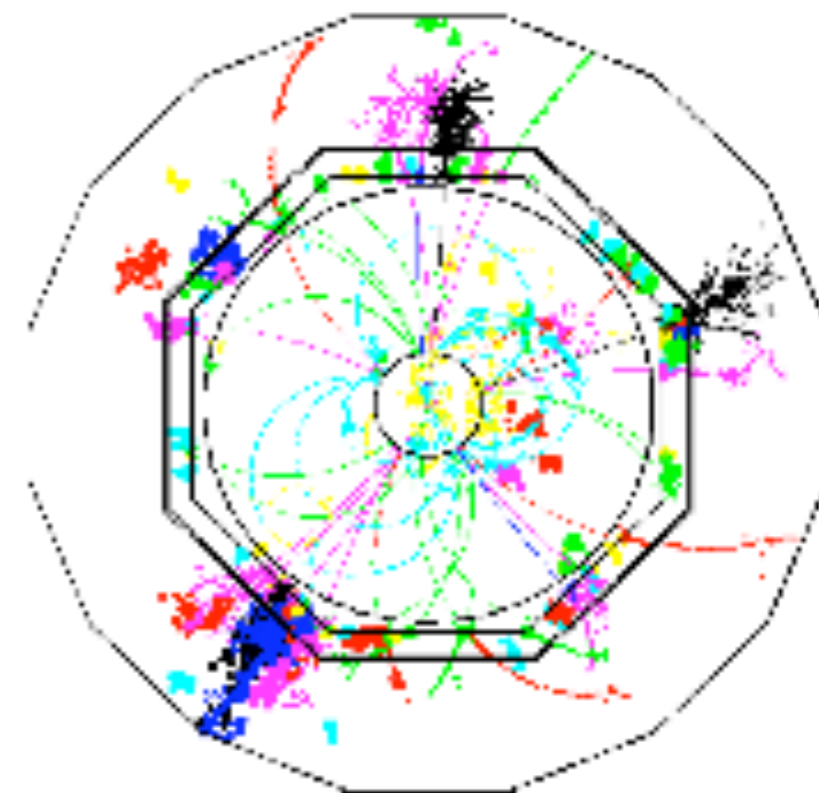
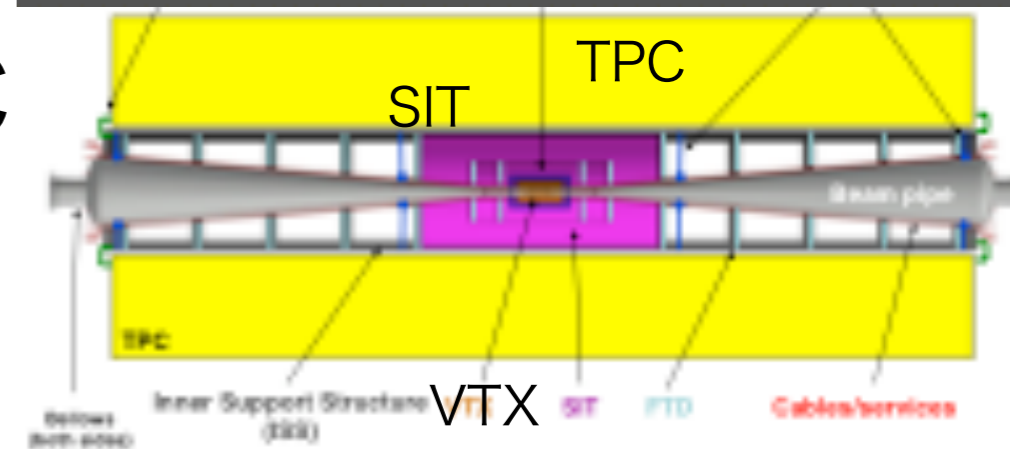
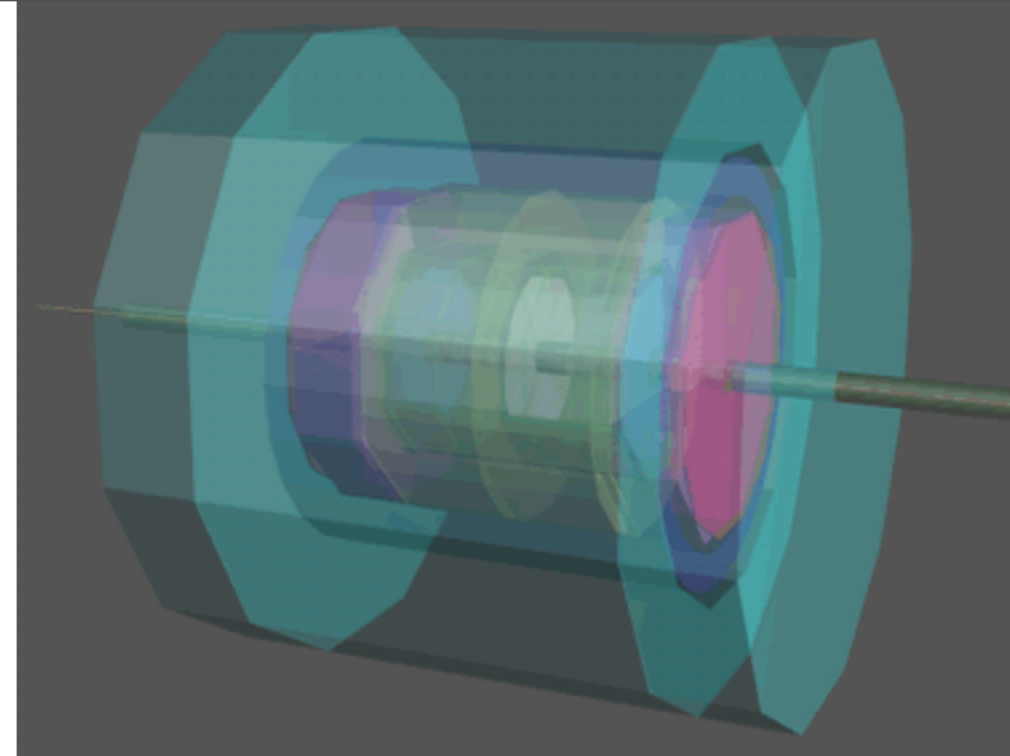


信州大学  
SHINSHU UNIVERSITY

Tohru Takeshita for ILC concept group

# ILD concept

- **Large Detector for PFA**
- long tracking distance :  
30-180cm, ~200 points TPC  
& silicon track. comb.
- VTX : close to IP  $\sim 1.5\text{cm}$   
full angular coverage
- fine calorimeter  
segmentation  $0.5/R > 185\text{cm}$
- as possible technologies  
pursued for sub-detectors



# goal of ILD at 2012

- Define a detector with options, which are considered “**ready**” by the R&D groups and ILD
- Include list of alternatives which are less advanced, but are promising candidates
- Improve based on real **engineering** the **integration** of the detector and its overall realism

Overall funding situation of R&D is critical, and decreasing

# ILD base lines

- **simulation base line SBL** performance
  - a unique set of sub-det. with reality
  - includes detailed det. model
  - will be defined in 2010
- **detector base line DBL** technology
  - realistic technical solutions for sub-det.
  - discuss with R&D group
  - will have a review in 2012

# ILD simulation BL

- to improve
  - tracking code
  - ghost sim. in tracker
  - background overlay ( forward)
  - details in sub-detector cables, services, material, cracks,,,
  - calorimeter difference
- to evaluate **physics performance**

# ILD reconstruction

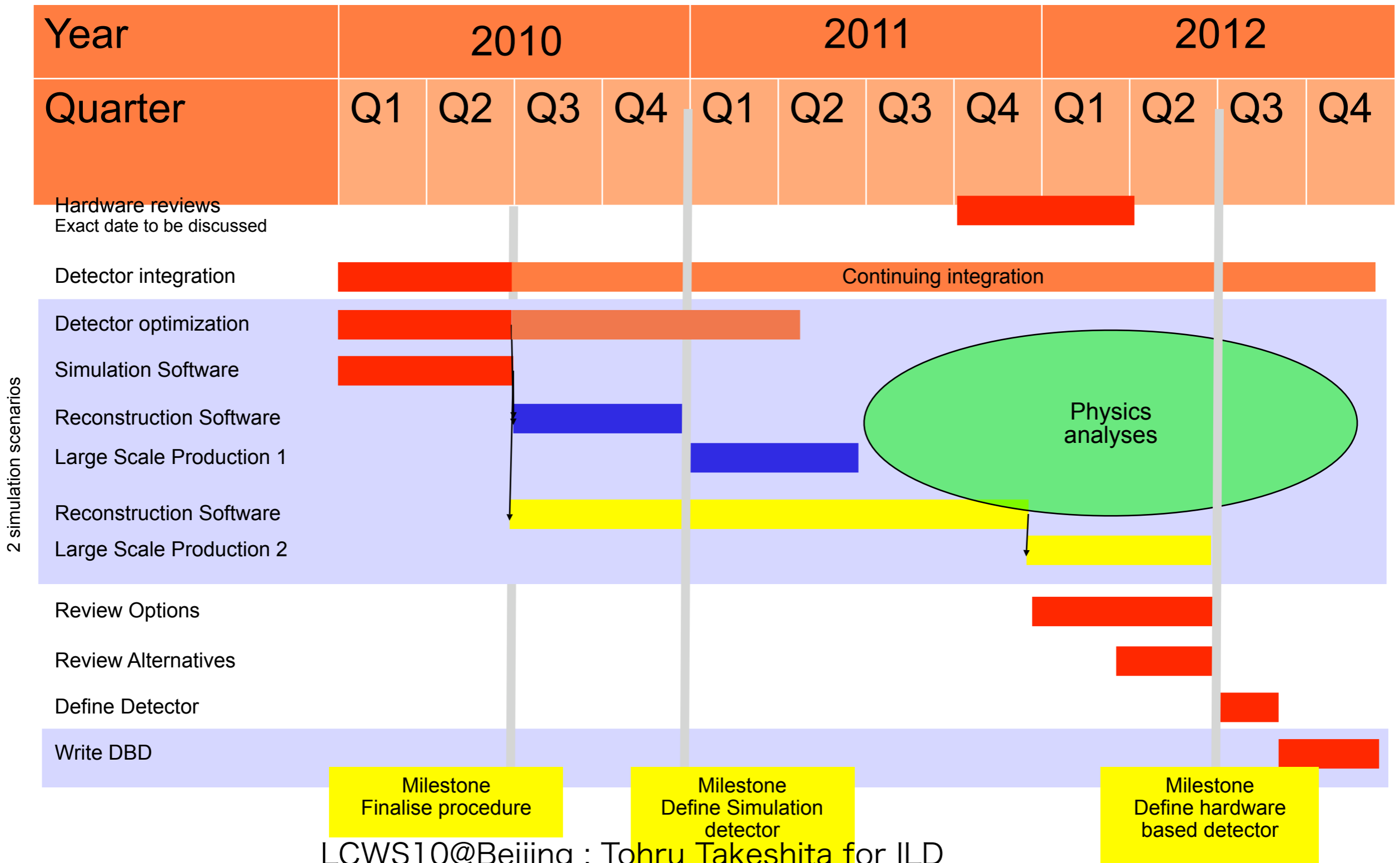
- simulation Base Line
- improvements are needed
  - tracking code to handle BG
  - Silicon tracking
  - TPC digitization
  - tuning of PFA for different cal.
  - complete bunch-train

# Goal of Det. BL

- define a detector with options
- feasibility proven
- with real engineering model
- include alternatives
  - promising candidates
- choose sub detector as late
- integrations & consistency for  
push-pull / MDI : engineers
- cooperation with SiD

# ILD time line in SBL

## Main Milestones





# ILD Det. BL

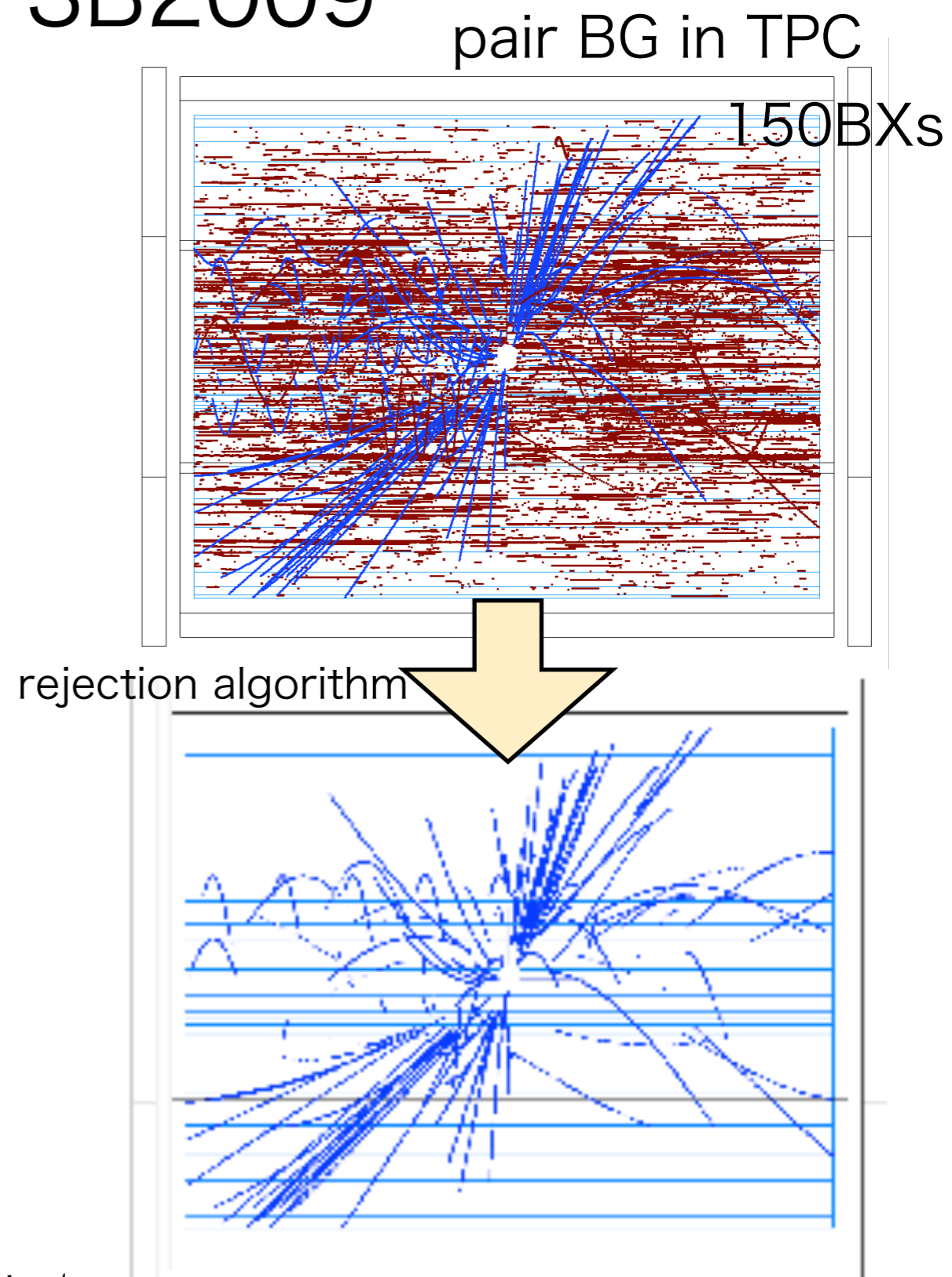
- integration of sub-det.
- geometrical boundary
- space between sub-det.
- cooling model
- power distribution

# ILD Det. BL

- Sub Detector
- technology
- mature and ready
- integration model with sim.
- dead material (cables, services, cooling and cracks)

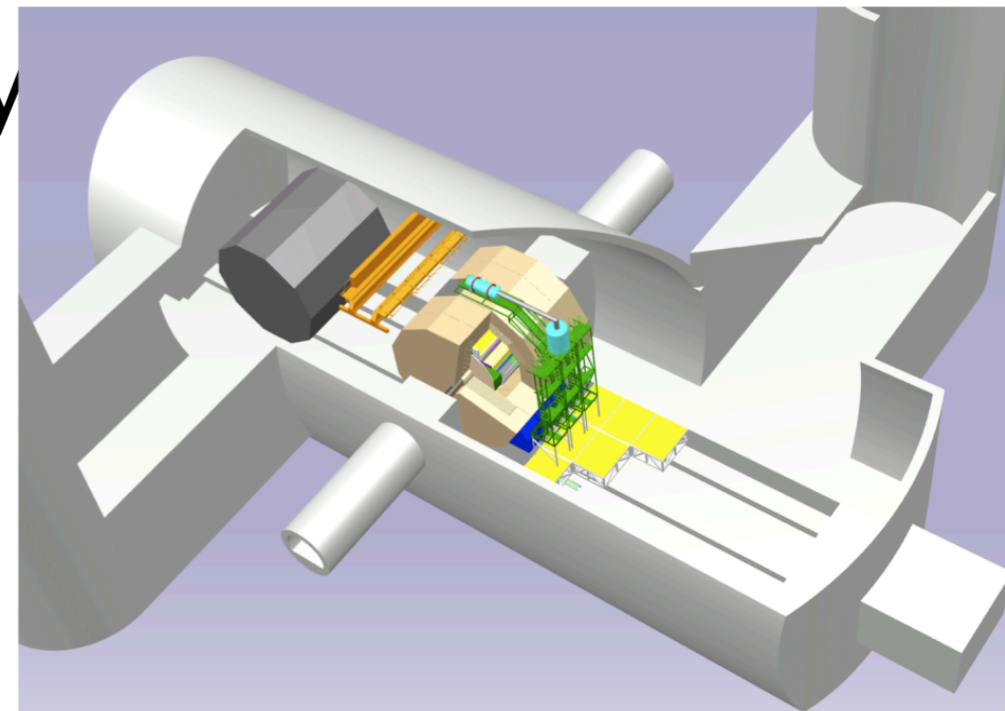
# BackGround

- improve estimation for SB2009
- two photon BG
- synchrotron radiation
- beam halo muons



# ILD DBD in 2012

- **physics performance** with better simulated detector
- based on the SBL det.
- **realistic det.** technology choice with options



# VTX status

Flavor tagging & vtx. charge

- beam background study (sim)

two photons as well

- granularity & material budget

0.16%X0/ layers (double layer)

- occupancy & rad. dose

- two designs: in sensor and ladder comb.

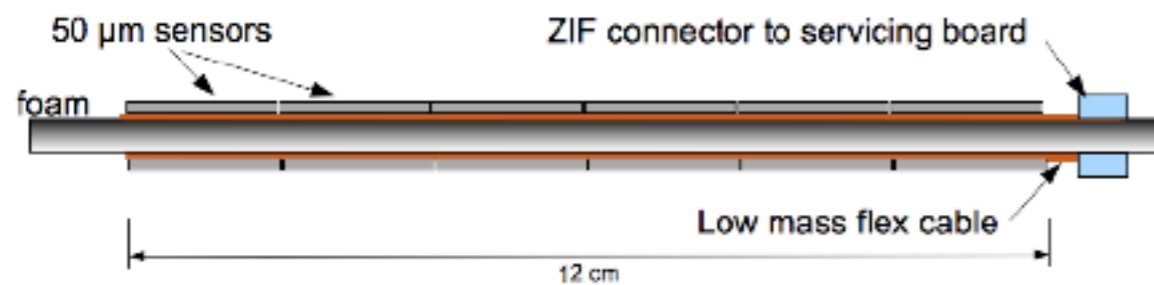
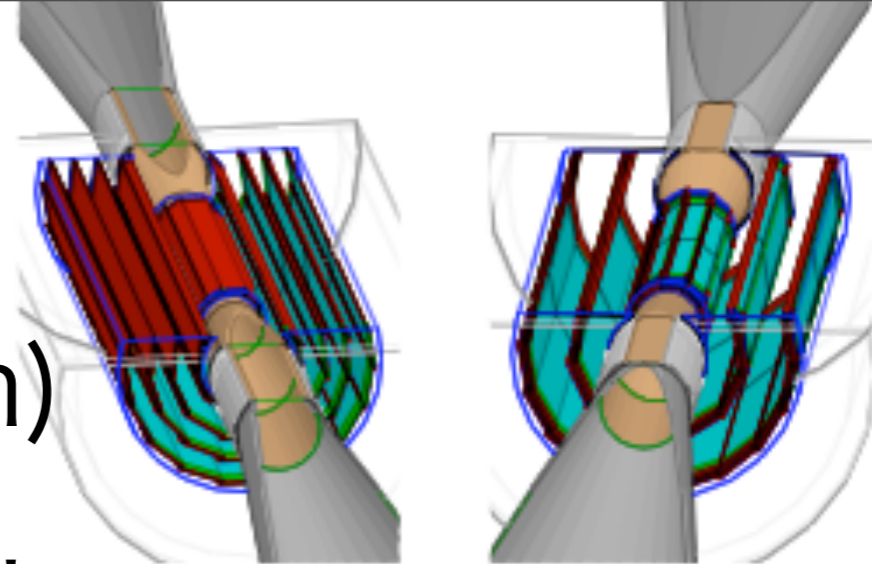
MIMOSA/FPCCD/DEPFET/APSEL/3D

- single/double sided

5 / 6=2\*3 layers

- mech. ladder

- innermost unsupported



# VTX plan

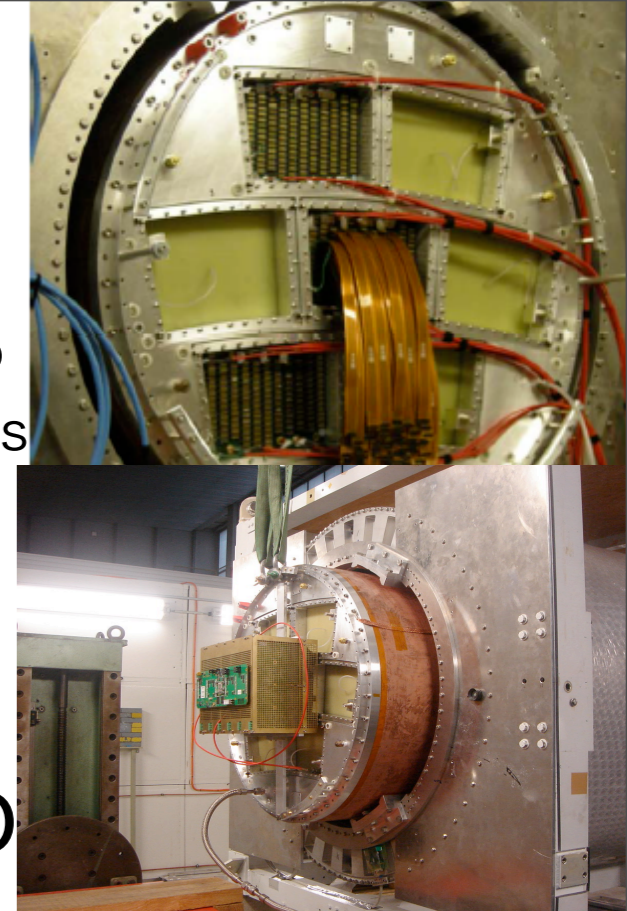
- 2011: parameters frozen
  - sensor parm. for pixel technologies
  - ladder designs
  - Cryostat & service
- 2012: performance
  - sensor performance
  - ladder parameters : material budg.
  - alignment
  - engineering integration

# TPC status

- achievements

- SP & LP1 endplate with GEM & Micromegas

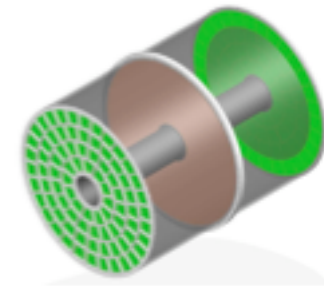
Micro  
megas  
&  
GEM



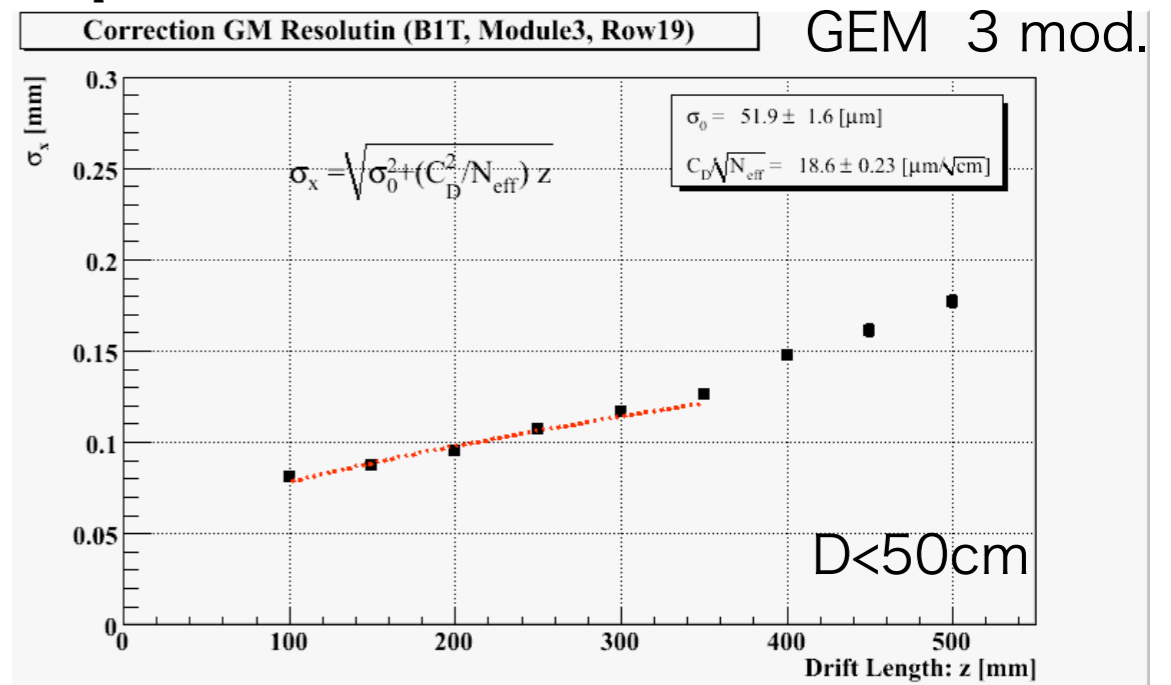
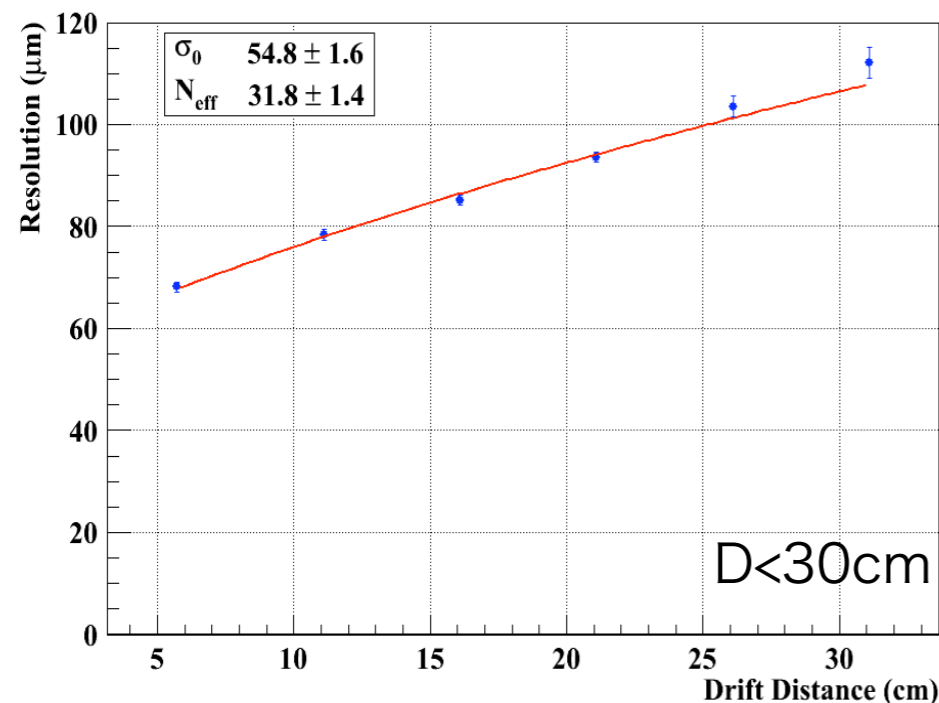
- gas, position resolution, resist. ano

- current activities

- LP1 (GEM, Micromegas)+pix read out



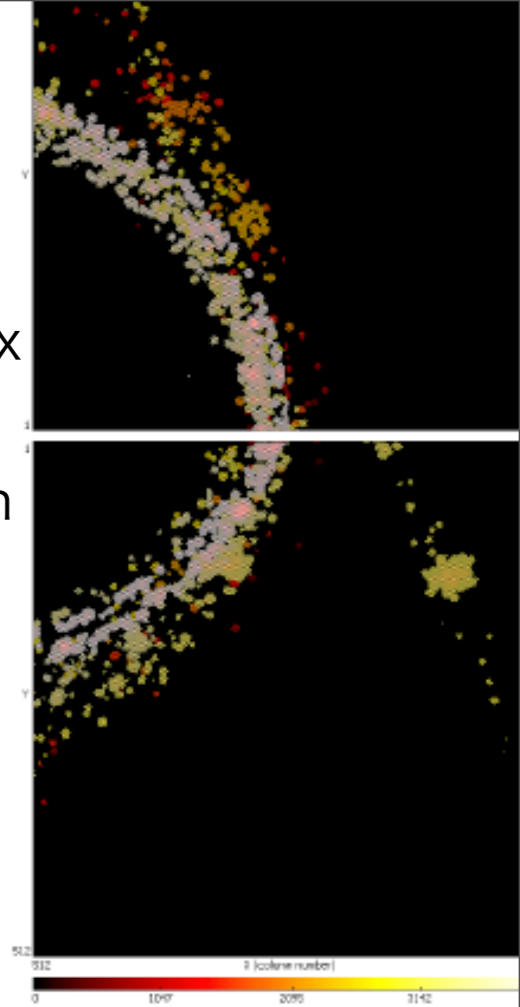
Micromegas 1 mod.



# TPC plan

- LP1 : 2007-2012
  - test construction technique
  - demonstrate momen. measure  
6GeV/c
- LP1.5:~2012
  - demonstrate measure. momenta  
two track separation
  - ion back flow : gating
- LP2: 2012~
  - prototype include elex. ,cooling, power pulsing, thin end plate 0.15X0 ,,

time pix  
chips  
500kch

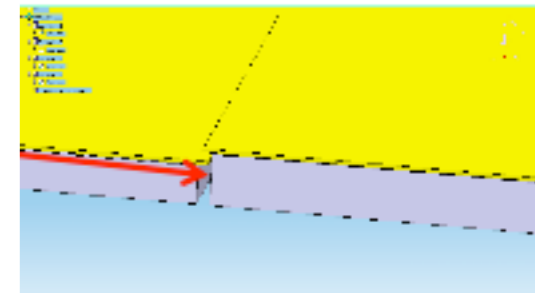
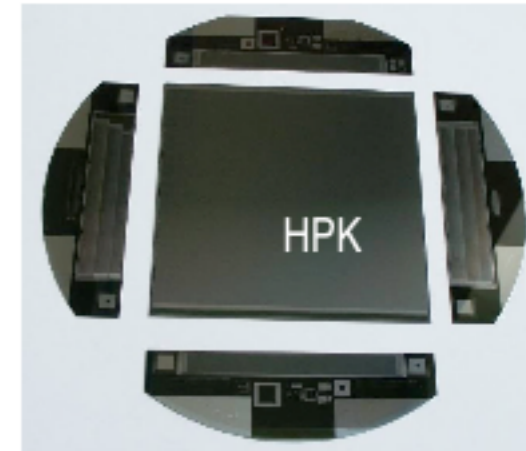
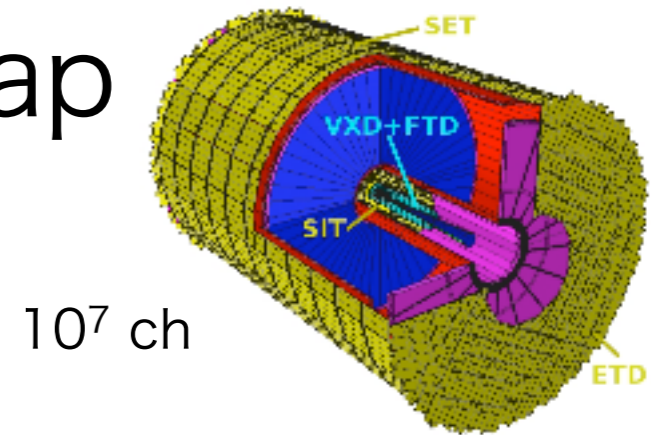




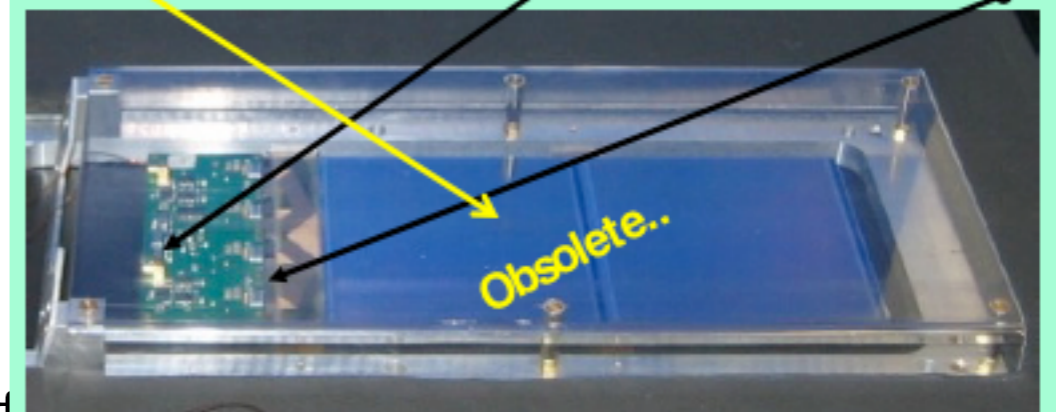
# Silicon tracker status

- disk (very forward) & barrel/endcap
- silicon strip sensor : 6' to 8' 200  $\mu\text{m}$
- alignment
  - improve laser trans. 20 to 70%
  - new method ready
- edgeless sensor dev.
- FE and RO electronics
  - direct connection  
processing , synchronization,
- DAQ
- Beam Test

ONE size, 180m<sup>2</sup>



**NO MORE Hybrid FEE board +pitch adapter**

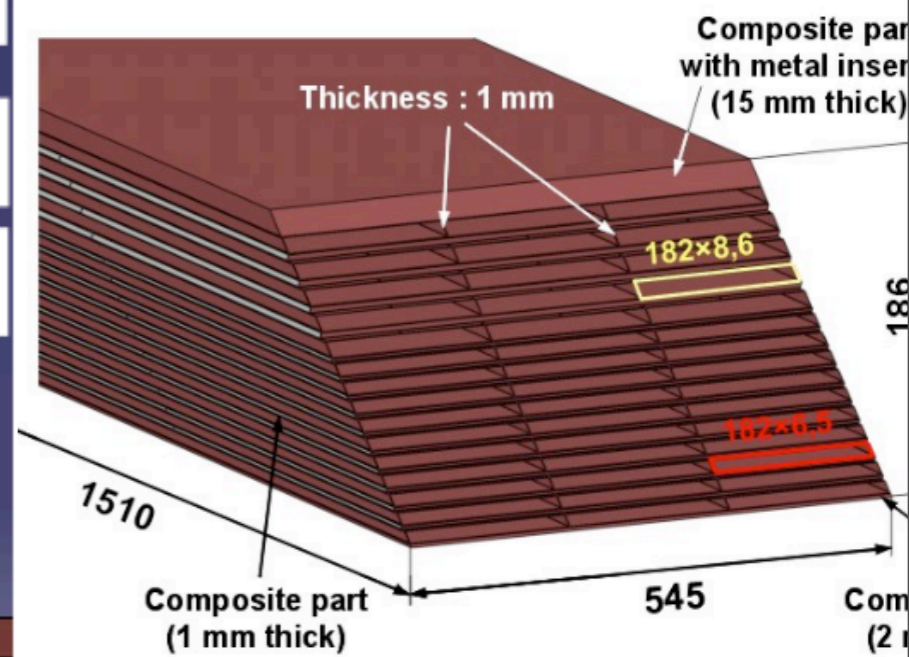
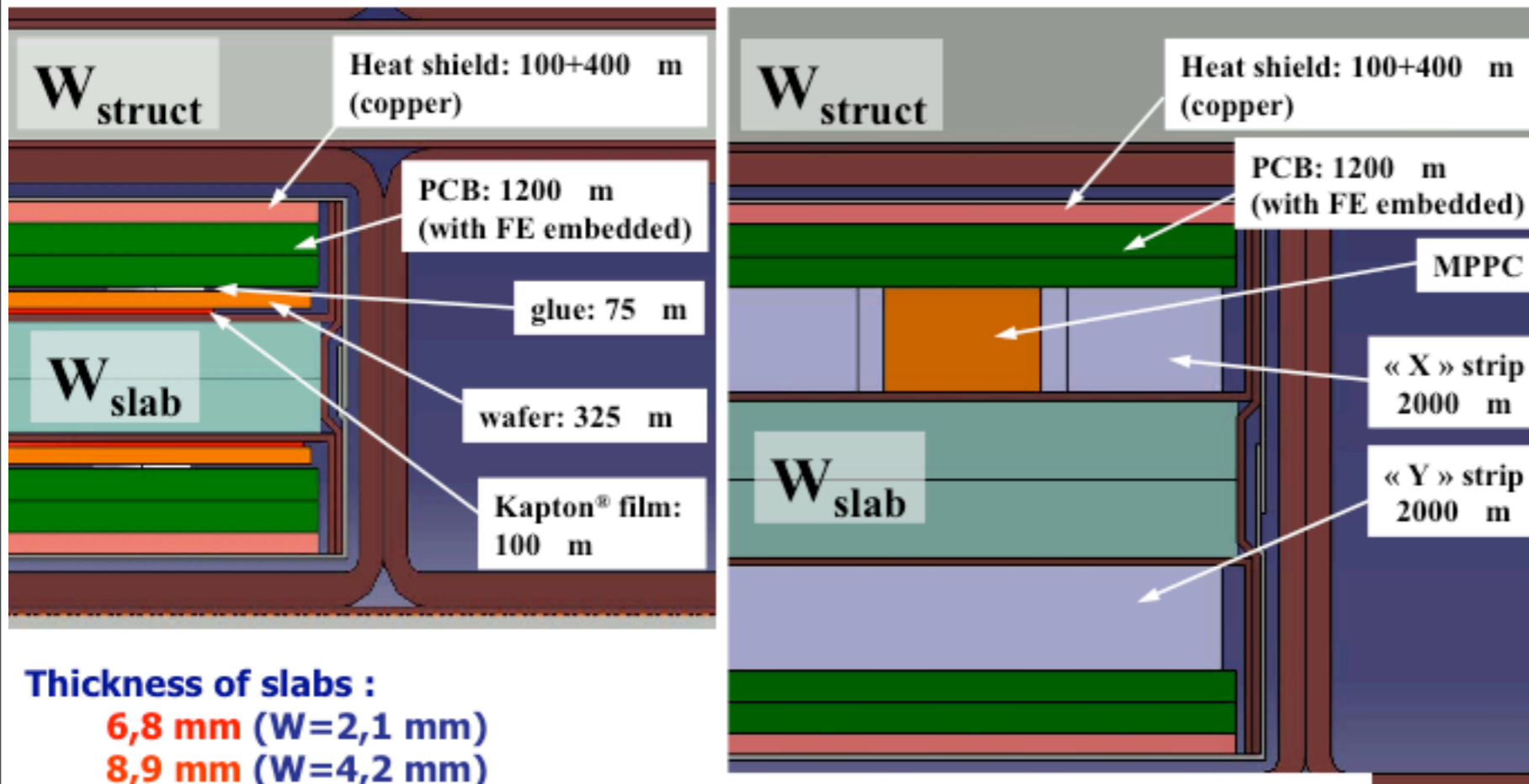
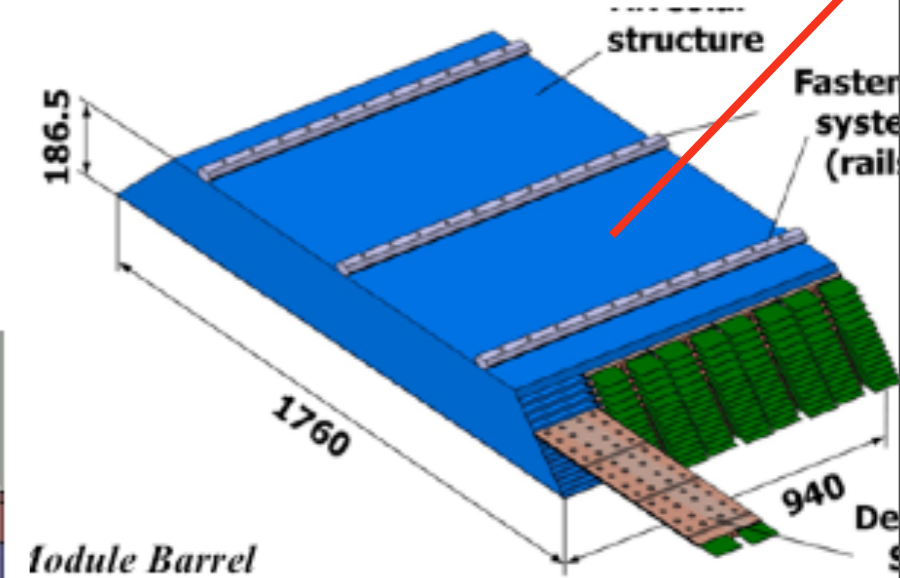
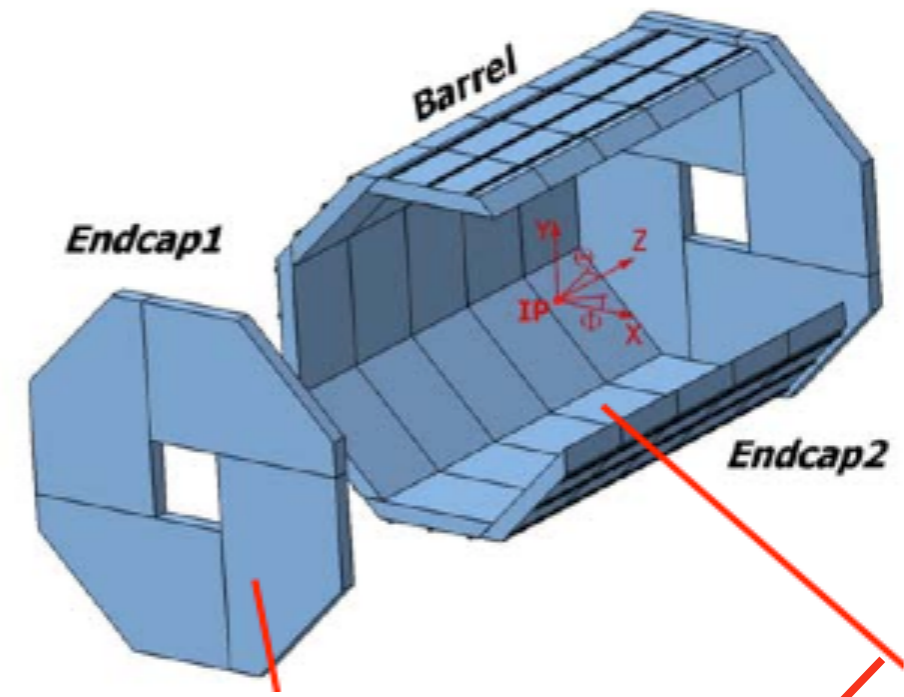


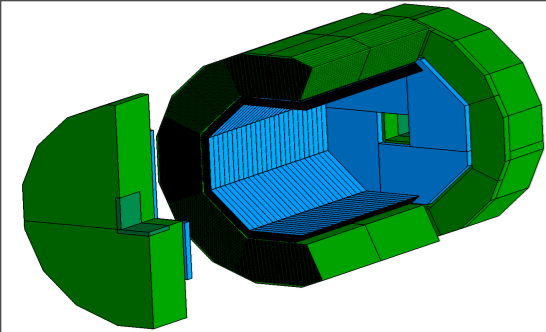
# Silicon tracker plan

Workpackage	item	2010	2011	2012
1) sensors	Strips 200 $\mu$ m/8''	Collab with	Industry	Test 1 <sup>st</sup> series
	A.F. strips	R&D	Full proof	Industry transfer
	Active edge strip	R&D	R&D	Industry transfer
2) Direct connection Chip-strips	Wire bonding	Prototyping &	R&D with firm	industrialisation
	Bump bonding	Prototyping	& R&D with	Industry (HPK)
	3DVert connect	R&D	R&D	R&D
	alternative	R&D	R&D	prototyping
3) FEE chip R.O.->DAQ	130nm-128ch	Foundry/test/	New prod for	Test beam protos
	90nm*, 256ch	design	Layout test	Equip protos F.P.
	New version**			New version
	Connect/Cabling	R&D	R&D & tests	R&D & tests
	Path to DAQ	R&D	R&D & tests	
4) Detector Construction & integration	Elem. Module			
	cooling			
	Alignment syst.			
	Support struct.			
	CAD detector studies			
	Integration study			
5) Test beams & simulation studies	Will accompany	& complete the	R&D studies &	developments
	Will accompany	& complete the	R&D studies &	developments

# ECAL overview

- PFA
- fine segmentation  $\sim 5 \times 5 \text{mm}^2$
  - large R :  $2400 \text{m}^2 \sim 100 \text{Mch}$
  - 30 layers
  - two options for sensor  
silicon / scintillator

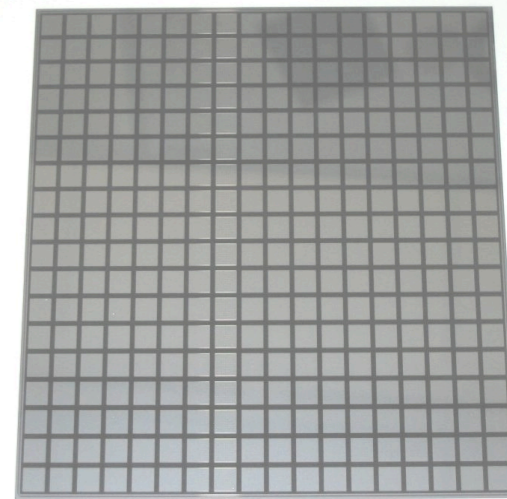




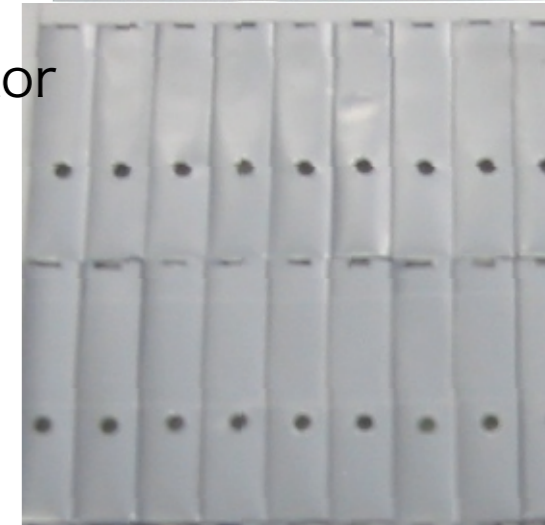
# ECAL status

- tungsten absorber
- 2 technologies as sensor
  - silicon pad : BT 10kch
  - scintillator strip : BT 2160ch

silicon  
pad



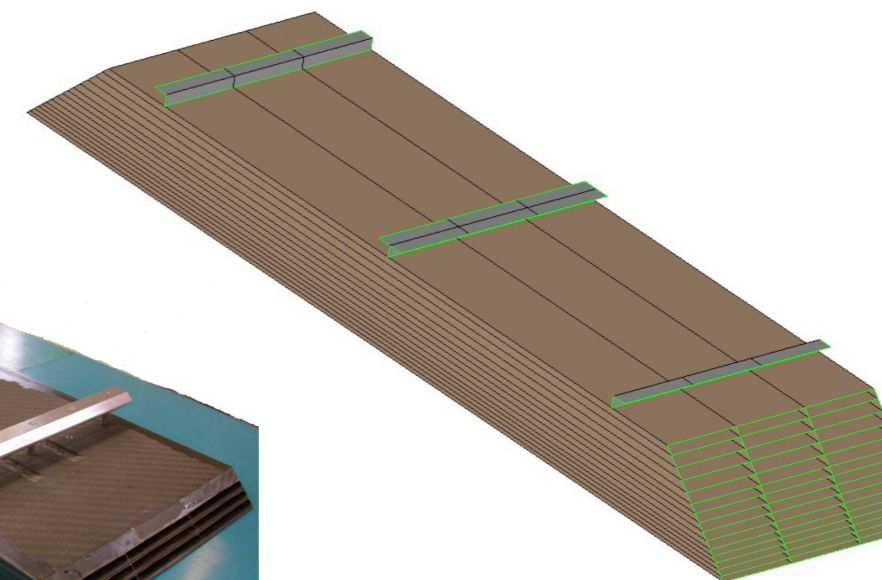
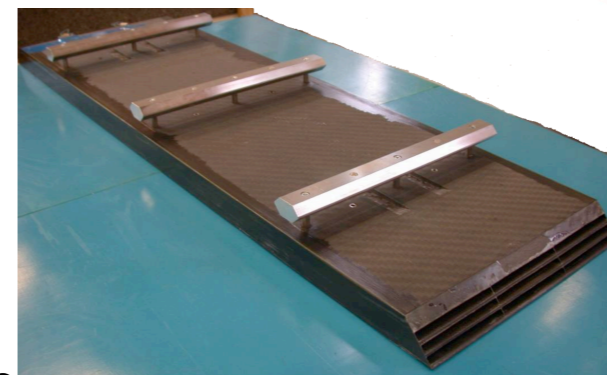
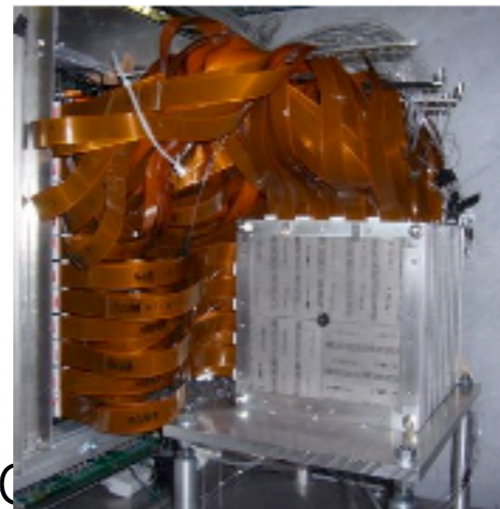
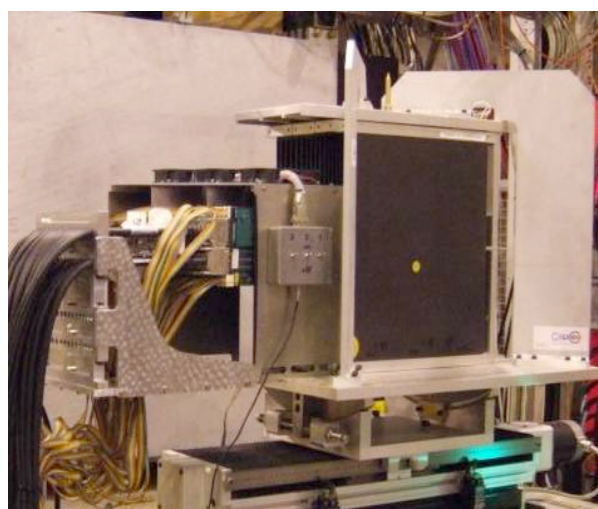
scintillator  
strip



slide in  
structure

current act.

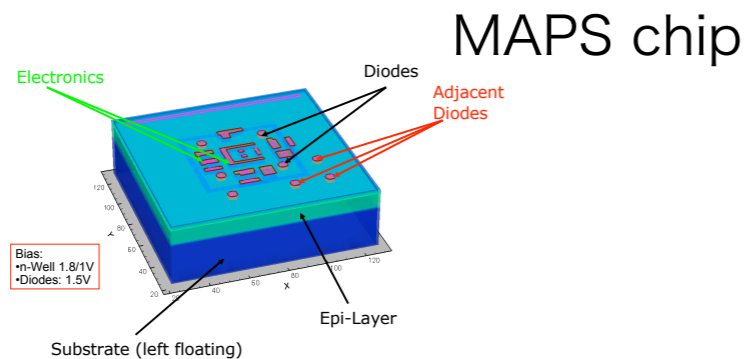
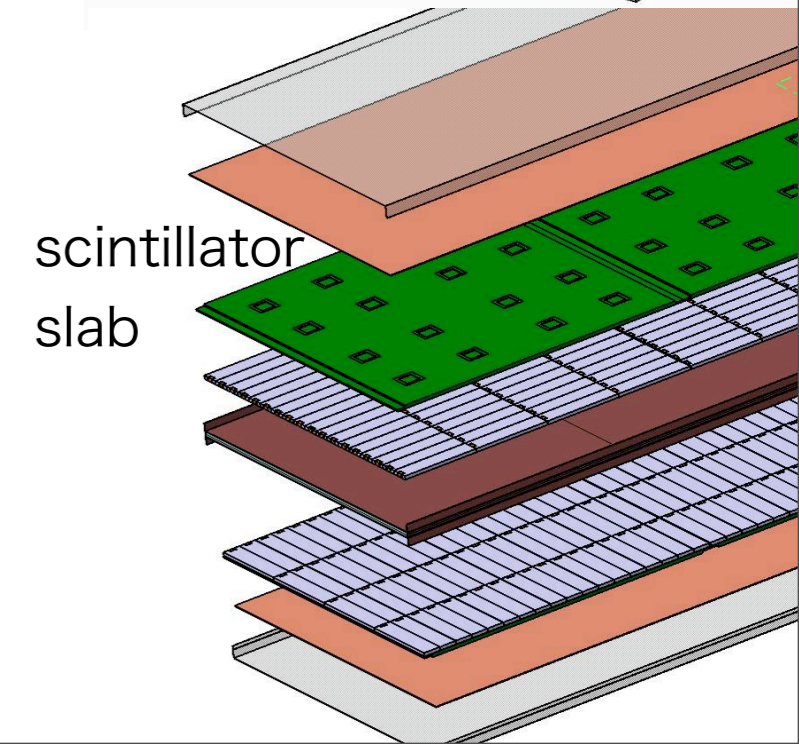
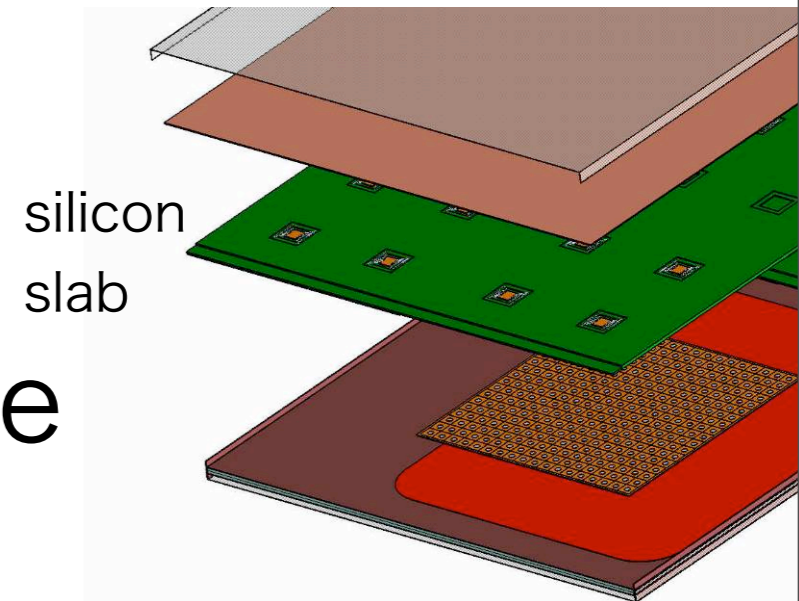
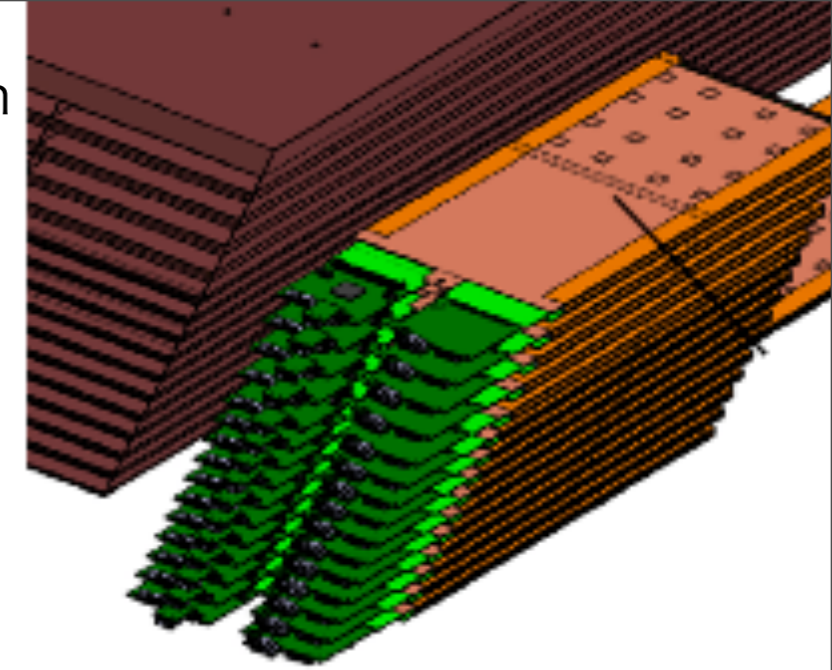
- in the same mechanical structure
- may have a combination



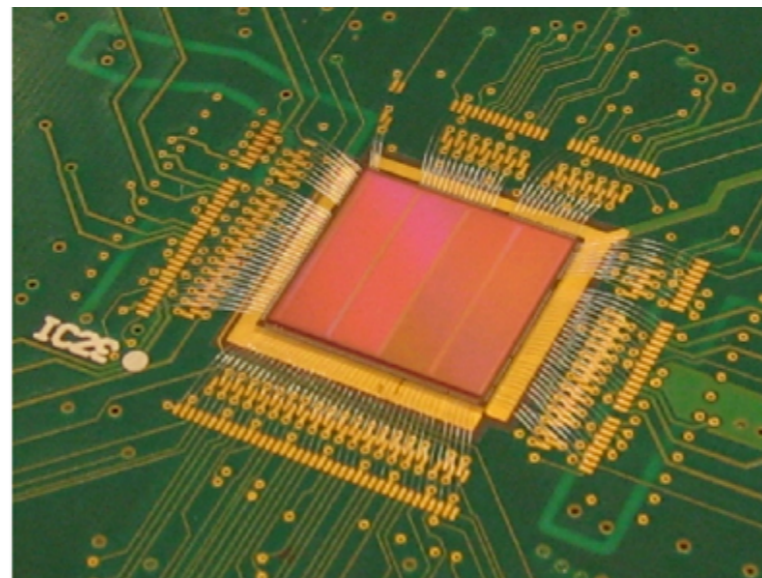
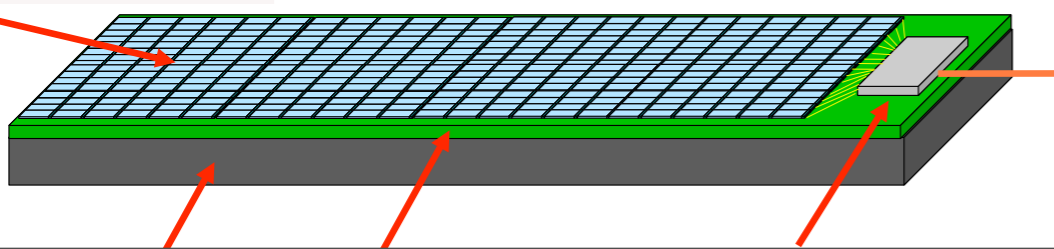
# ECAL plan

common  
slab  
design

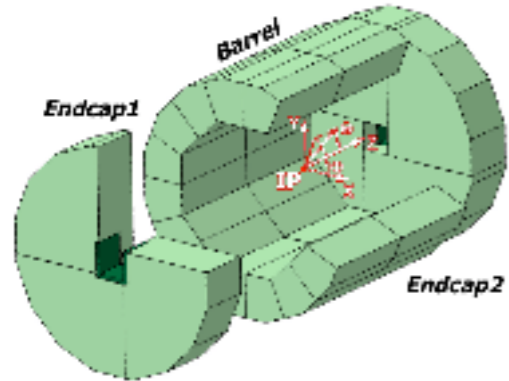
- 2010: slab prod. w. elex.
- 2011: test thermal & mecha.
- 2012: test beam
- sim. study of combined module
- digital MAPS development



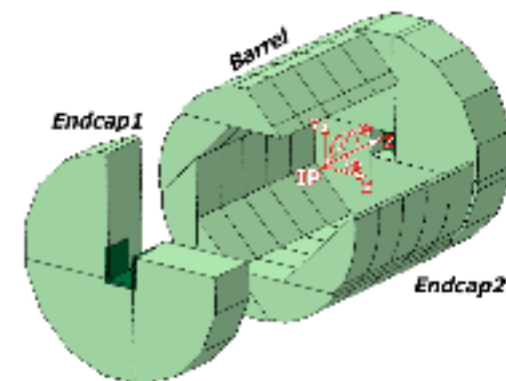
MAPS det,



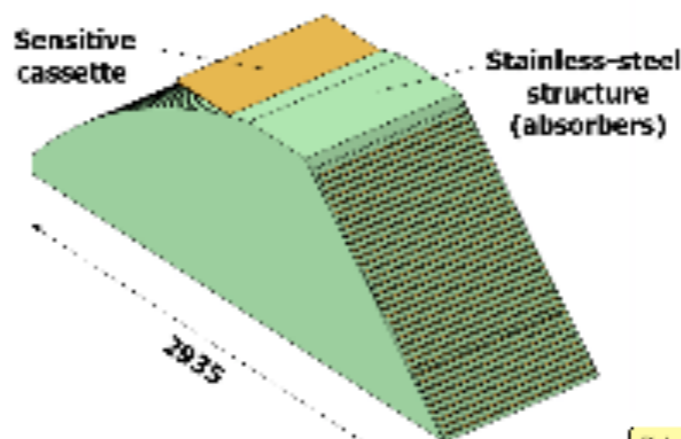
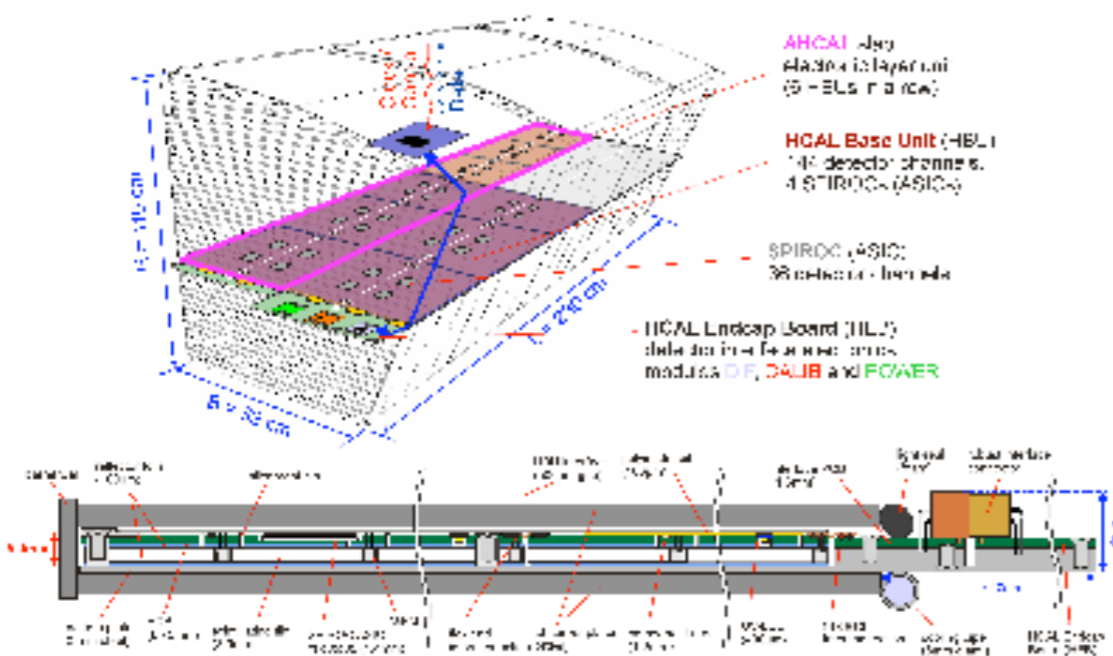
Tohru Takeshita for ILD



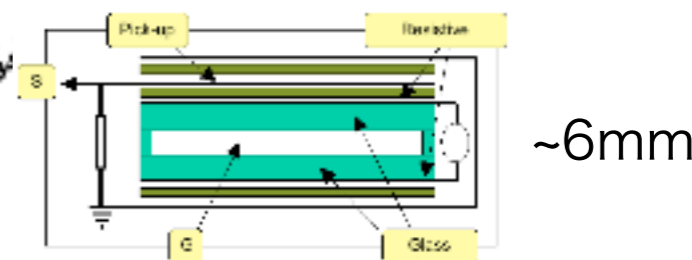
# HCAL overview



- steal absorber
- 2 sensors
- Analog : scintillator tile 3cm x 3cm  
1cm x 1cm
- Semi-Digital : RPC / Micromegas

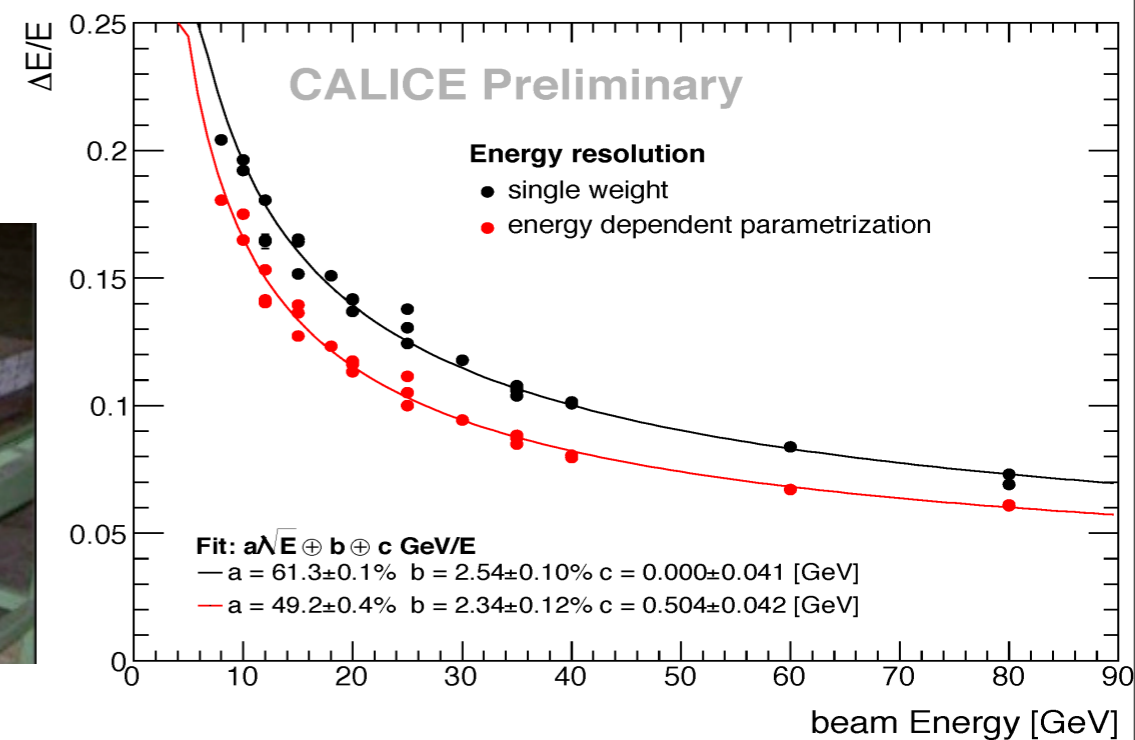
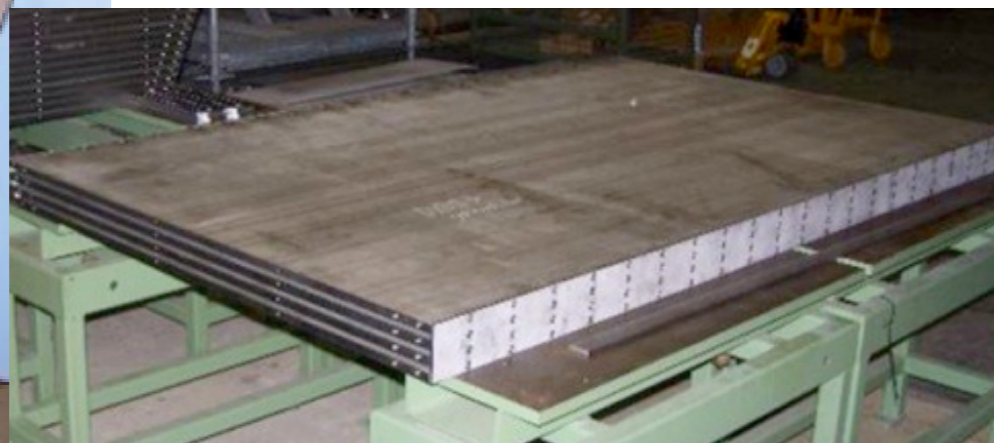
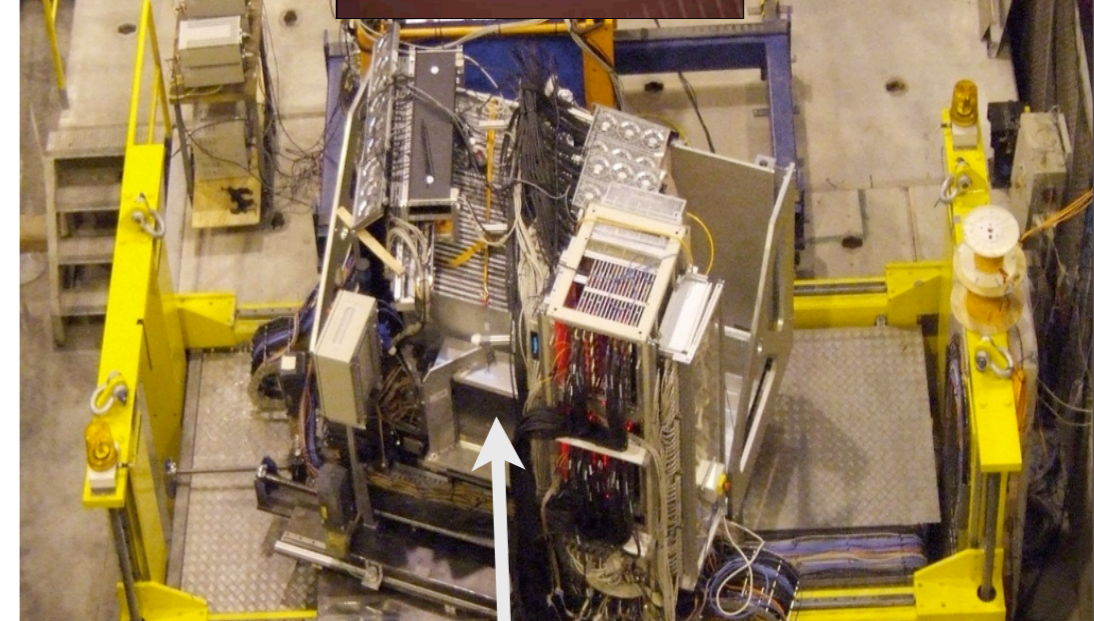
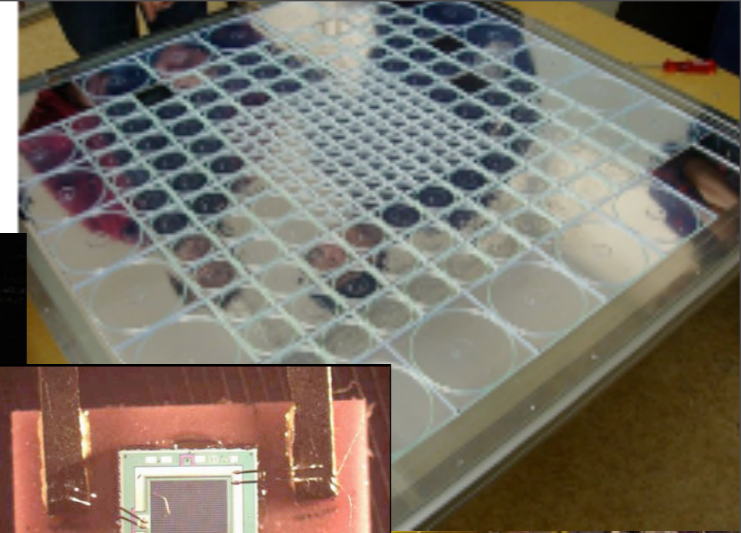
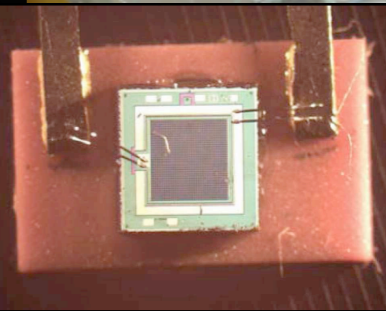
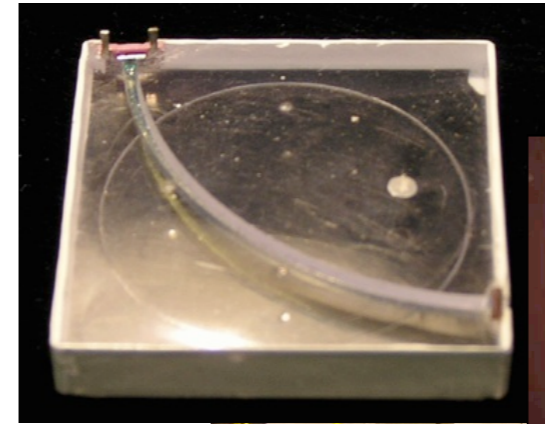


~6mm



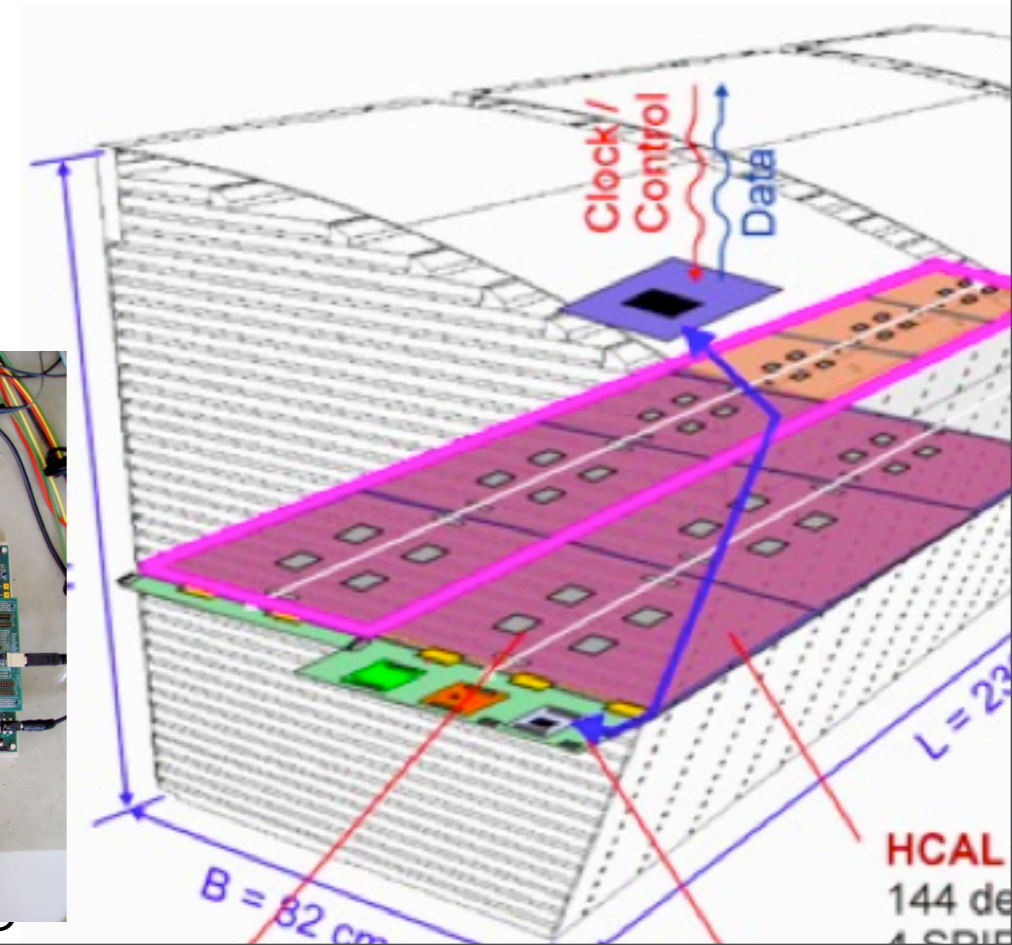
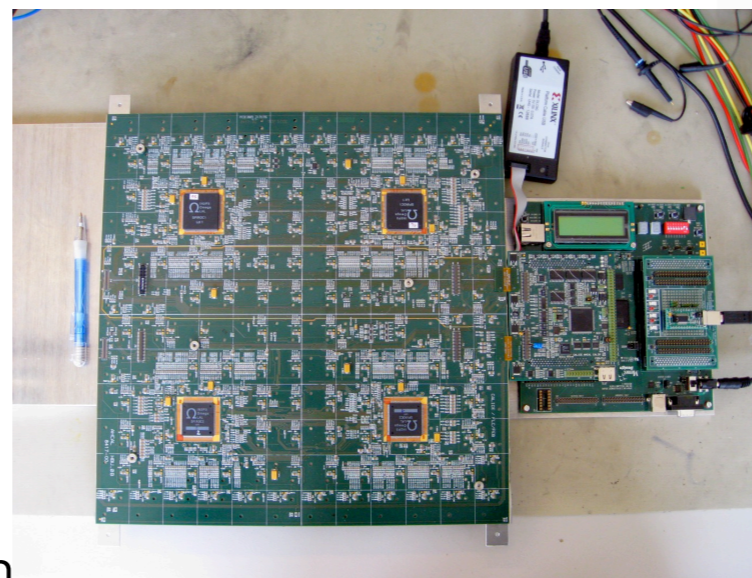
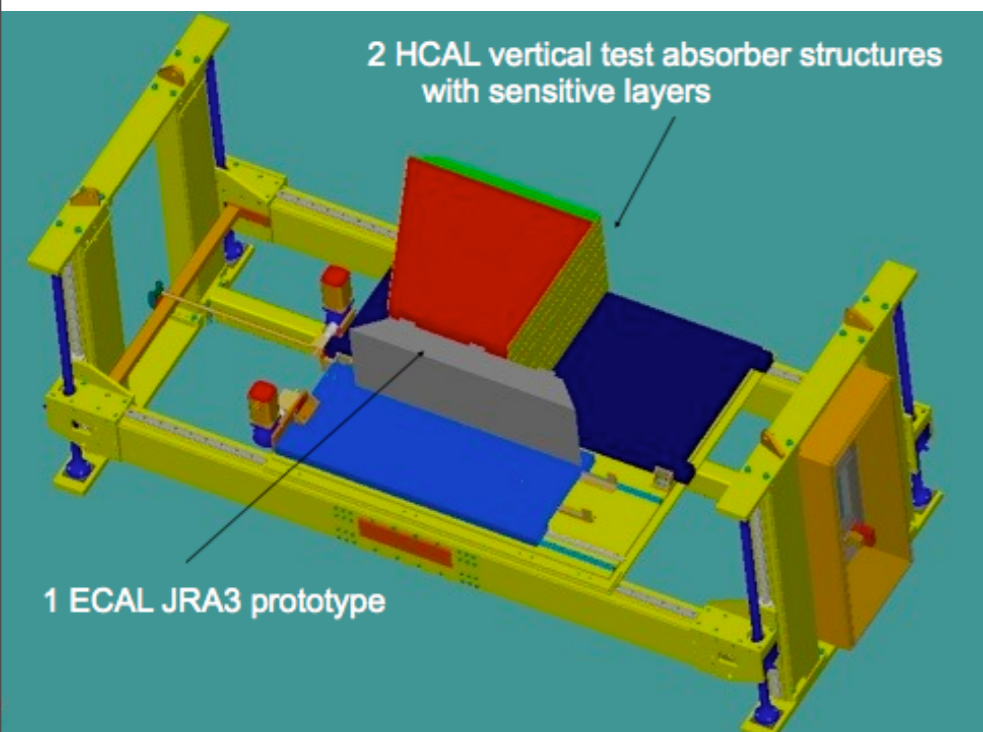
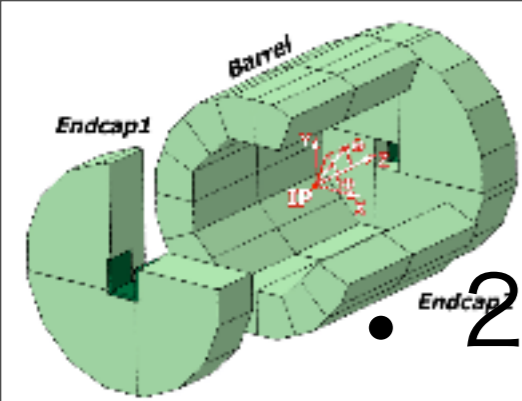
# AHCAL status

- scintillator tile  $3 \times 3 \text{ cm}^2$
- 38 layers of  $1 \text{ m}^3$   
7600ch
- TB at 4 years 2006-2009  
stable operation
- current act.
- mechanical structure



# AHCAL plan

- 2010 : beam tests with a single readout module with embedded electronics, & build 2m long layer demonstrator
- 2011 : test of 2m long layer and build small e.m. size tower demonstrator
- 2012 : test of e.m. tower, ready for full HCAL module
- beyond

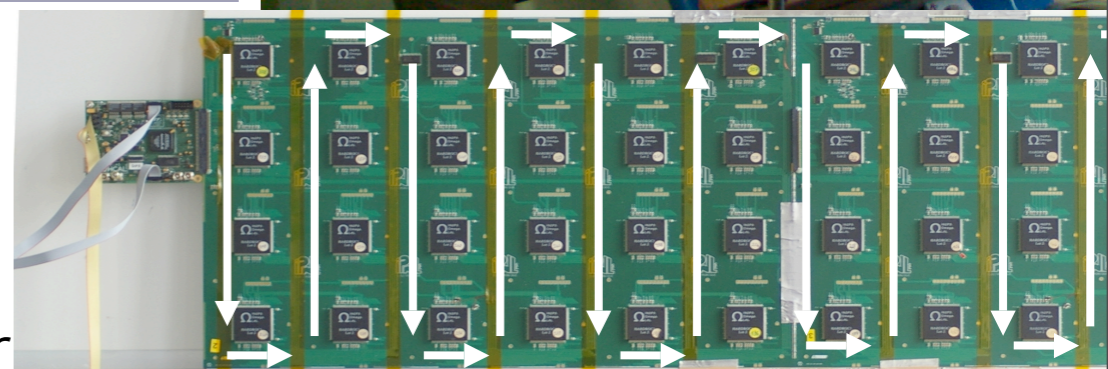
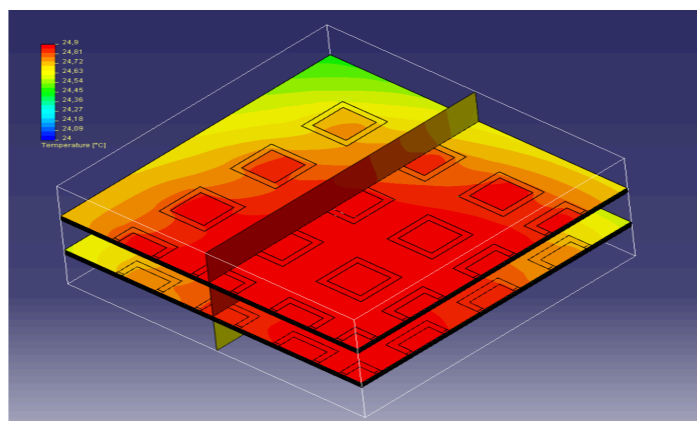
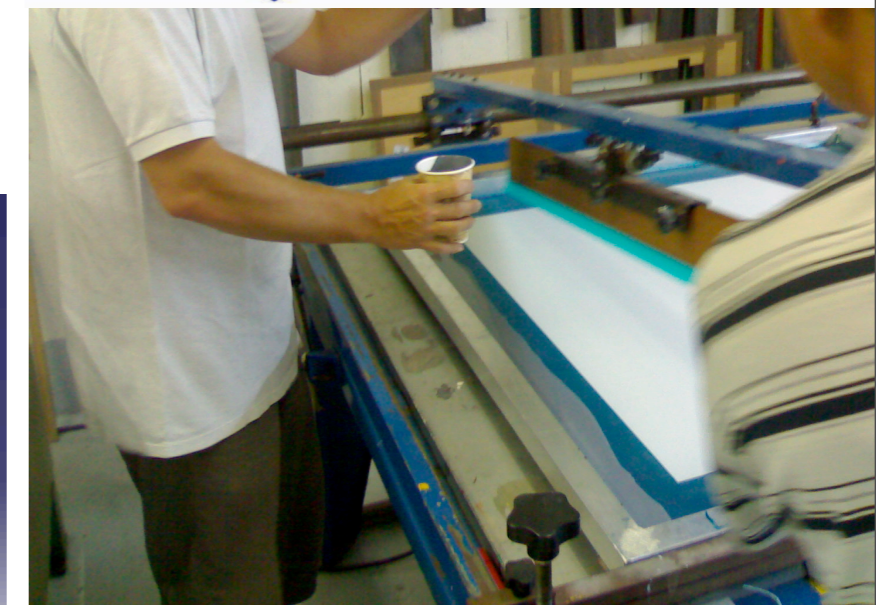
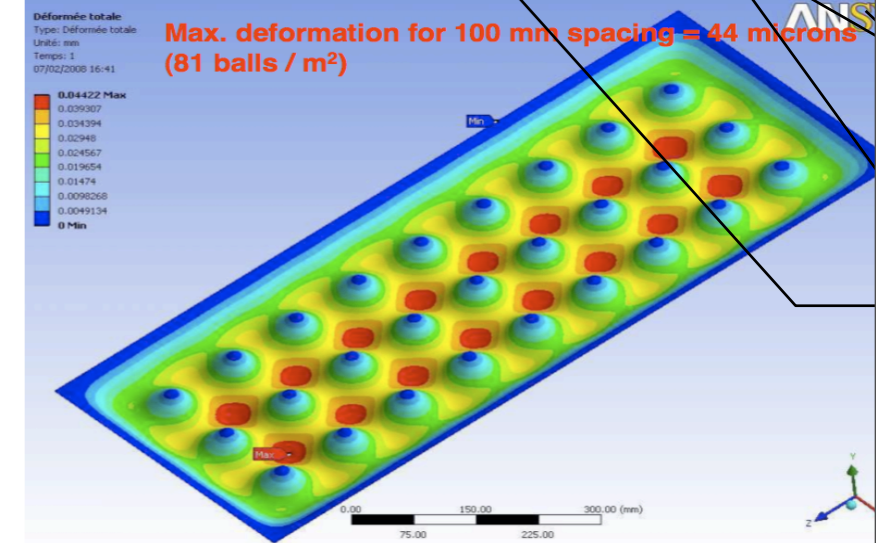
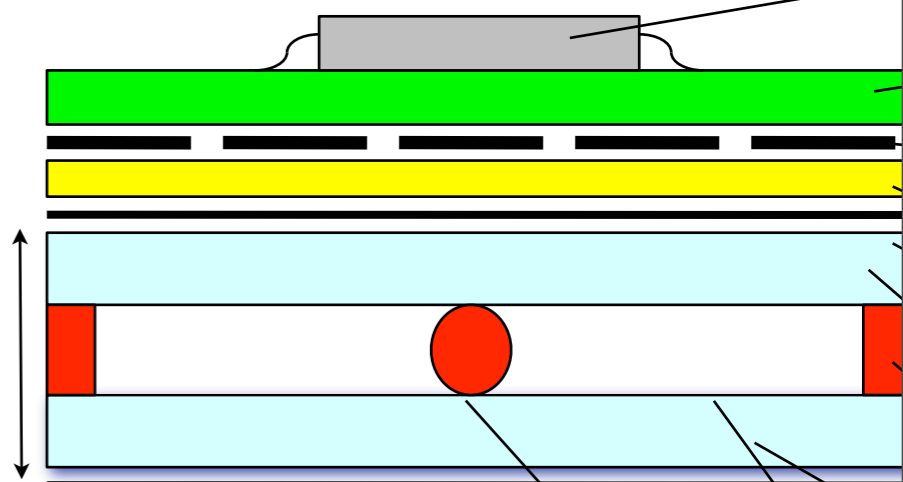




# SDHCAL status

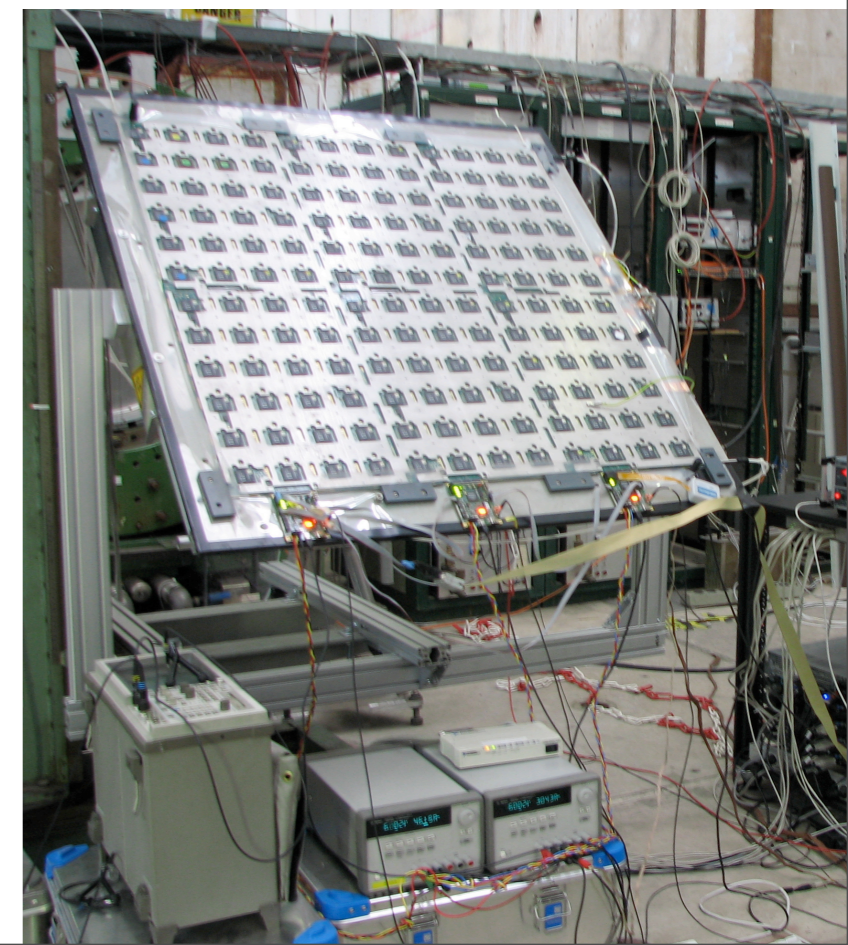
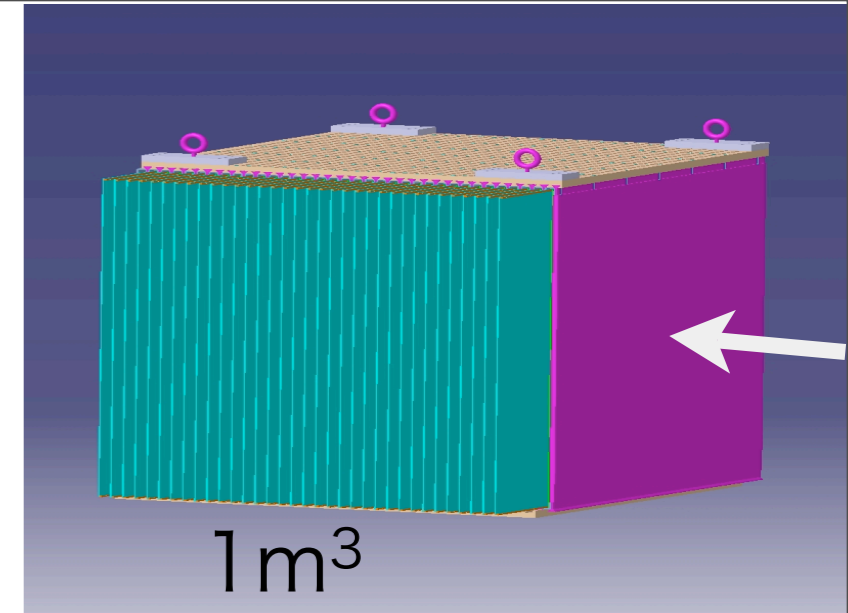
- GRPC : 1 m<sup>2</sup>
- flatness <math>< 44 \mu\text{m}</math>
- resistive coating few M  $\Omega$  /  $\square$
- silk screening paint  
5C by cont. power
- electronics
- thermal study
- cosmic test bench

GRPC cross section  
3mm

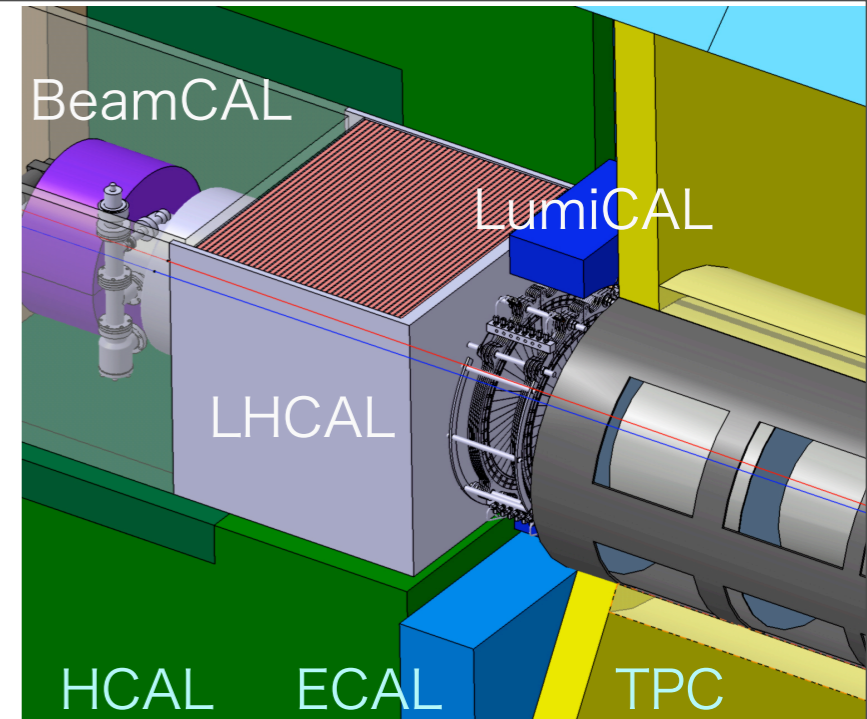
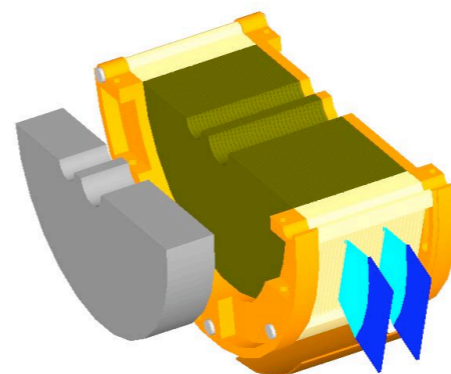
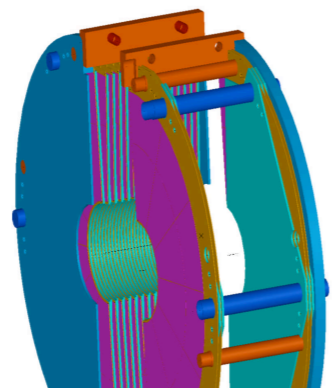


# SDHCAL plan

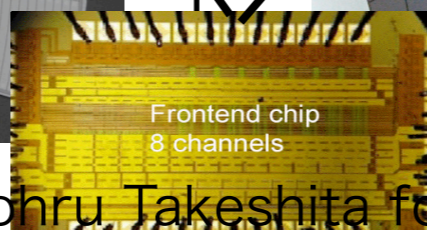
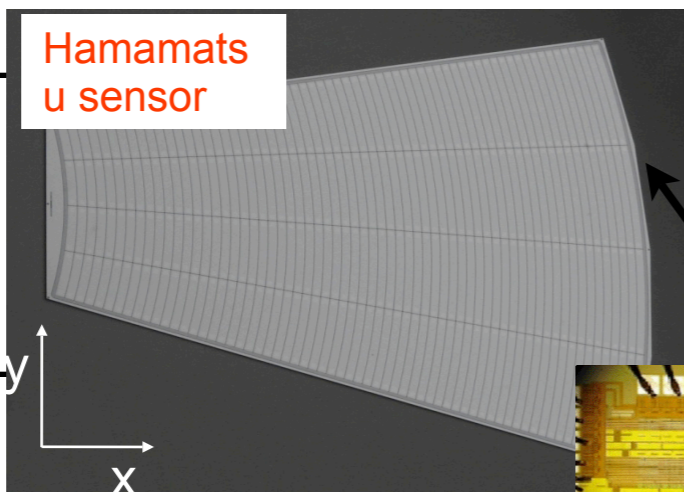
- 2010 : construction of  $1\text{m}^3$   
GRPC mass production
- 2011 : BT of  $1\text{m}^3$   
equipped : power pulsing, auto-support structure, services,,,
- 2012 : proof of principle of semi-digital HCAL
- test with multi-gap GRPC



# FCAL status & plan

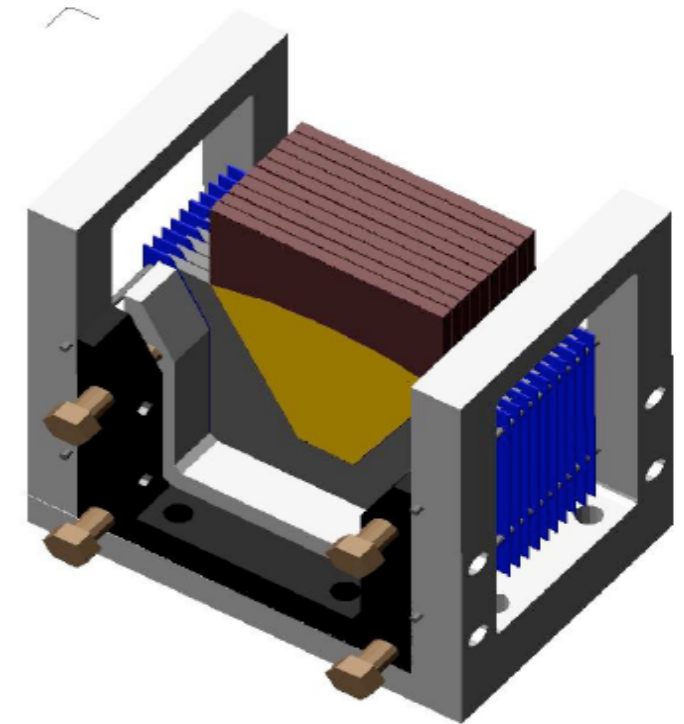
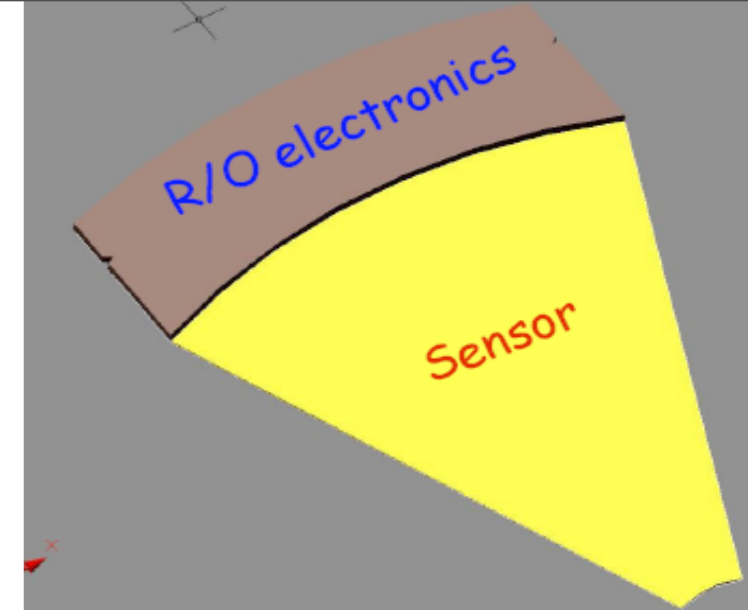


	LumiCal	BeamCal	Pairmonit.
design	si/W	si/W	
sensor	Hamamatsu/Si	JINR /GaAs	
current	V-I	thickness	small chip
photo			

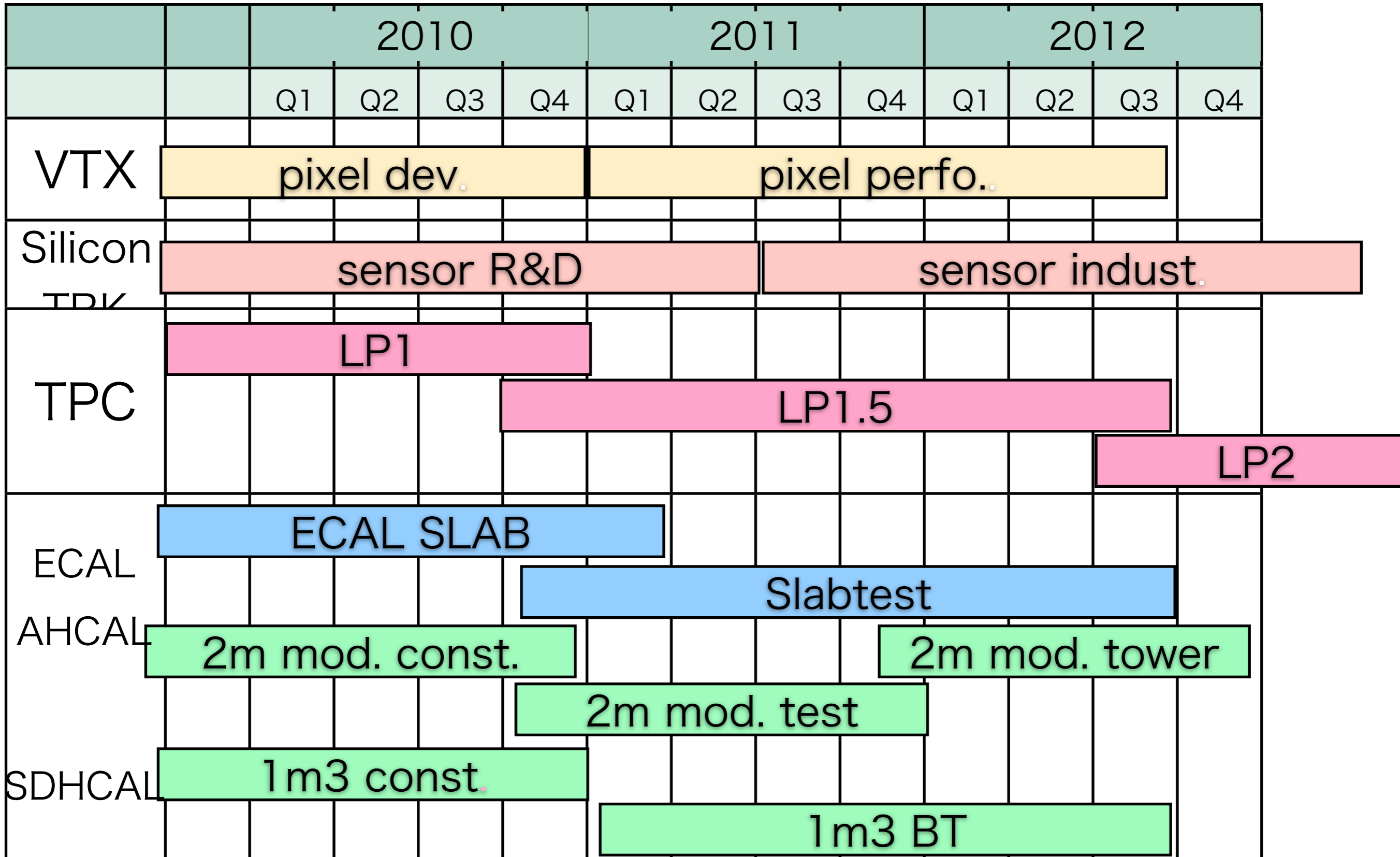


# FCAL plan

- 2010 : Full assembly of a prototype sector LumiCal & BeamCal
  - sensor & ASICs
  - DAQ development
  - lab and beam test
- 2011 : Beam Test
- 2012 : analysis & prepare DBD



# sub. det. summary



# summary

ILD status and plan

- simulation BL and detector BL
- simulation BL : **performance**
  - add & tune : improved BG, det. dead space, better modeling,,
- detector BL : **technology**
  - decide end of 2012
  - depend on R&D group
- significant progress from LOI
- prepare **a DBD 2012**